Animation: Mitosis and Cytokinesis

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Mitosis & Cytokinesis
Play
Pause
Audio
Text
Mitosis is a process of nuclear division by which replicated copies of a cell's DNA are organized into chromosomes. The identical copies of the DNA are then divided equally between two daughter cells.
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Cytoplasmic Division

- Also known as cytokinesis
- Begins during anaphase
- Continues through telophase
- Contractile ring pinches cytoplasm in half

Animation: Control of the Cell Cycle

Control of the Cell Cycle
Play
Pause
Audio
Text
The process of cell growth and division in eukaryotes is called the cell cycle. This cycle is divided into phases based on what is happening in the cell at a given time. A cell grows during the G1 phase.
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3.5: Control of Cell Division

- Cell division capacities vary greatly among cell types
  - Skin and blood cells divide often and continually
  - Neuron cells divide a specific number of times then cease
    - Chromosome tips (telomeres) that shorten with each mitosis provide a mitotic clock
    - Cells divide to provide a more favorable surface area to volume relationship
- Growth factors and hormones stimulate cell division
  - Hormones stimulate mitosis of smooth muscle cells in uterus
  - Epidermal growth factor stimulates growth of new skin
- Contact (density dependent) inhibition

Tumors are the consequence of a loss of cell cycle control

Tumors

- Two types of tumors:
  - Benign – usually remains localized
  - Malignant – invasive and can metastasize; cancerous
- Two major types of genes cause cancer:
  - Oncogenes – activate other genes that increase cell division
  - Tumor suppressor genes – normally regulate mitosis; if inactivated they are unable to regulate mitosis
    - Cells are now known

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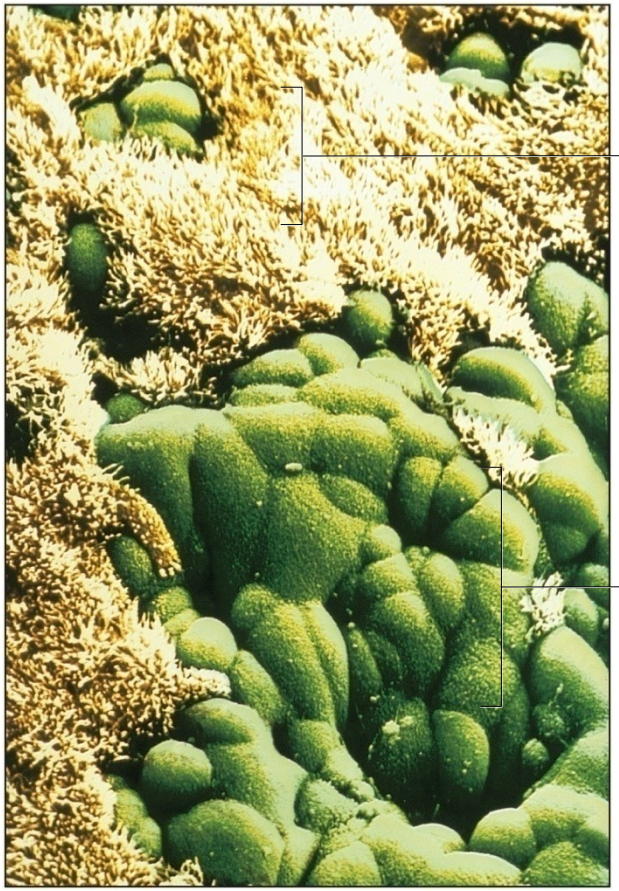

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Animation: How Tumor Suppressor Genes Block Cell Division

How Tumor Suppressor Genes Block Cell Division
M
C
G2
G1
S
Play
Pause
Audio
Text
During the first phase of the cell cycle, G1, there is a chemical "checkpoint" that a cell must pass to begin the process that leads to cell division.
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3.6: Stem and Progenitor Cells

- Stem cell:
  - Can divide to form two new stem cells
    - Self-renewal
  - Can divide to form a stem cell and a progenitor cell
  - Totipotent – can give rise to every cell type
  - Pluripotent – can give rise to a restricted number of cell types

Progenitor cell:

- Committed cell
- Can divide to become any of a restricted number of cells
- Pluripotent

Stem and Progenitor Cells

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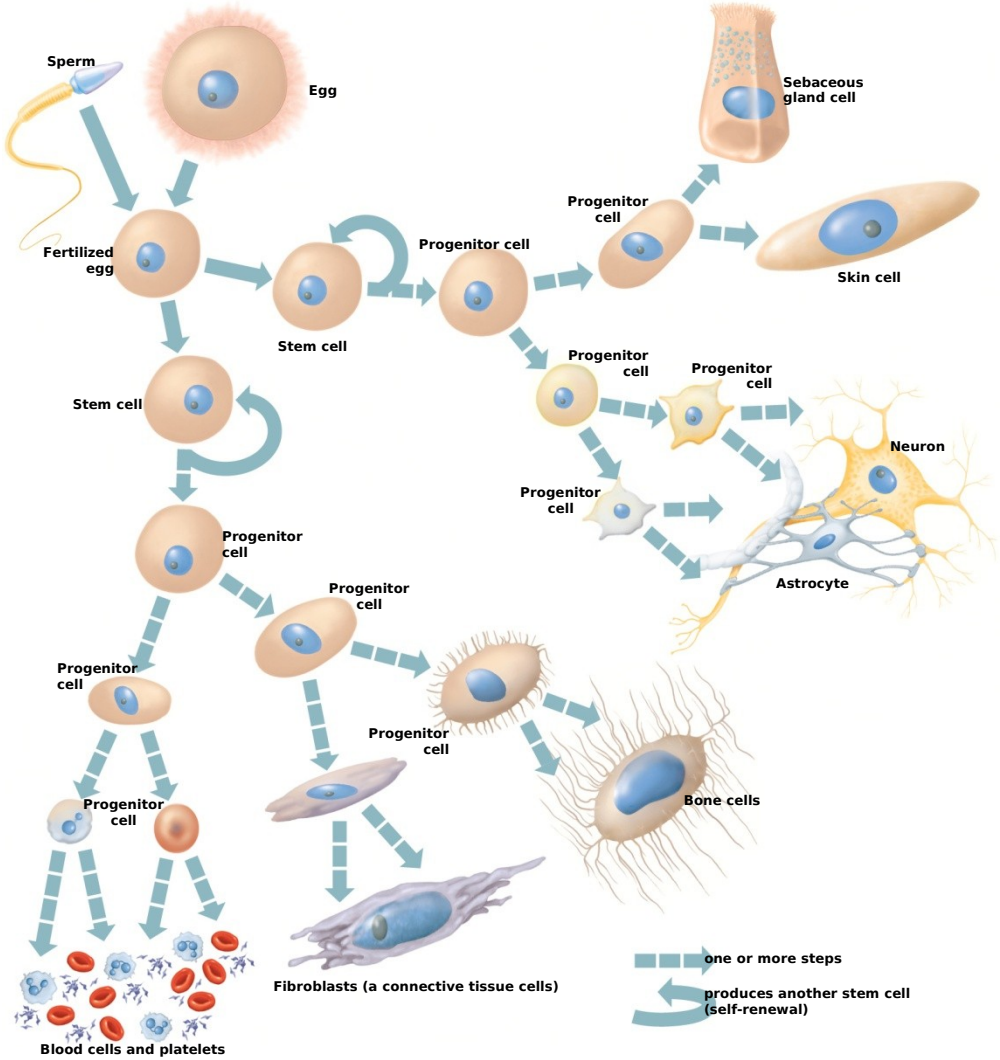

3.1 From Science to Technology

Therapeutic Stem Cells

3.7: Cell Death

Apoptosis:

- Programmed cell death
- Acts as a protective mechanism
- Is a continuous process